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Book 5
**Mathematics, Informatics and
Physics**

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RUSE

The Ruse Branch of the Union of Scientists in Bulgaria

was founded in 1956. Its first Chairman was Prof. Stoyan Petrov. He was followed by Prof. Trifon Georgiev, Prof. Kolyo Vasilev, Prof. Georgi Popov, Prof. Mityo Kanev, Assoc. Prof. Boris Borisov, Prof. Emil Marinov, Prof. Hristo Beloev. The individual members number nearly 300 recognized scientists from Ruse, organized in 13 scientific sections. There are several collective members too – organizations and companies from Ruse, known for their success in the field of science and higher education, or their applied research activities. The activities of the Union of Scientists – Ruse are numerous: scientific, educational and other humanitarian events directly related to hot issues in the development of Ruse region, including its infrastructure, environment, history and future development; commitment to the development of the scientific organizations in Ruse, the professional development and growth of the scientists and the protection of their individual rights.

The Union of Scientists – Ruse (US – Ruse) organizes publishing of scientific and popular informative literature, and since 1998 – the “Proceedings of the Union of Scientists- Ruse”.

BOOK 5

**"MATHEMATICS,
INFORMATICS AND
PHYSICS"**

VOLUME 10

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This is the jubilee 10-th volume of book 5 Mathematics, Informatics and Physics. The beginning was in Spring, 2001, when the colleagues of the former section Mathematics and Physics decided to start publishing our own book of the Proceedings of the Union of Scientists – Ruse. The first volume included 24 papers. Through the years there have been authors not only from the Angel Kanchev University of Ruse but as well as from universities of Gabrovo, Varna, Veliko Tarnovo and abroad – Russia, Greece and USA.

Since the 6-th volume the preparation and publishing of the papers began to be done in English.

The new 10-th volume of book 5 Mathematics, Informatics and Physics includes papers in Mathematics, Informatics and Information Technologies, Physics and materials from the Scientific Conference ‘Information Technologies in Education’ (ITE), held at the University of Ruse in November 2012 in the frame of Project 2012-FNSE-02.

EDUCATIONAL COMPUTER GAMES FOR DIFFERENT TYPES OF LEARNING

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Abstract: *This paper is related to a research developed in collaboration with three higher education institutions – University of Ruse, New Bulgarian University and South-West University "Neofit Rilski". The research is supported by National Fund: Bulgarian Science Fund, project ДФНИ-И01/10. The major objective of the project is to investigate innovative methods for assessing competence in e-learning environments. The article identifies the different types of computer games available and the kind of learning that can be supported with computer games*

Keywords: *E-learning, computer games, common game types, teaching, learning*

INTRODUCTION

The use of information technologies and multimedia in education has significantly changed peoples' learning processes. Results from a number of research studies indicate that appropriately designed multimedia instruction enhances students' learning performance in different subjects [4].

Computer games demonstrate effective pedagogical techniques that can be used in learning. Game environment enables new forms of knowledge interaction previously unavailable within the traditional curricula. It is powerful instructional tool - from illustrating principles in physics to practicing surgery on a virtual patient. The importance of providing such learning environments to science and engineering students is obvious.

The claims about using computer games in education are confirmed by the fact that this use :

- Is based on strict learning theories and principles.
- Provides engagement for the learner.
- Provides personalized learning environments.
- Supports 21st century skills.
- Provides an environment for authentic and relevant assessment.

1. GAME PLATFORMS

There are distinctions among different electronic hardware. Digital games can be console-based or computer-based. The latest generation of consoles includes Microsoft's Xbox 360, Sony's Playstation 3 and Nintendo's Wii along with handheld devices such as the Nintendo DS and Sony PSP. While some games are console specific, many games can be played across multiple platforms [2].

This paper describes digital gaming, regardless of whether it is on a handheld, a console or a PC.

2. MODES OF PLAY

In addition games can be characterized by the modes of play - some are single-player and some are multiplayer; some are handheld and some are online.

➤ **Single-Player mode** - single-player mode allows one player to play on one platform.

➤ **Multiplayer mode** - although PCs and handheld games allow only a single player's experience, console games support multiplayer modality. All game consoles

are manufactured with multiple controller ports and thus more than one player can play at a time.

➤ **Network mode** – network mode allows multiple players to play a single game simultaneously. The computers must be networked together, but the game may run either on a server on the network or through peer-to-peer connection.

➤ **Online mode** – online games are a subset of networked games with sufficient distinct characteristics. This subset is treated as a separate type of games according to these characteristics.

3. GAME GENRES

Games come from many different genres, including first-person shooters, role-playing, action, adventure, card, puzzle and sports. Some are single-player and some are multiplayer; some are handheld and some are online.

Computer games, like books and movies, come in a number of different genres. The literature offers the following categorization:

Adventure

Adventure-style games are typically story-driven and have one or more central characters. These games are perceived mostly like movies and can rely heavily on dialogue, exploration and logical problem solving to move the player through the narrative [5].

A classic example in this genre is the interactive fiction game *Myst*. The tasks in the game may be relevant to the curriculum and the learning process, often in terms of motivation, as in the case of *Civilization*, a widely popular and researched game that involves geography, history and politics [1].

Shooting /Action

This category includes a different gameplay perspectives and subgenres. These games can include First Person Shooters (FPS) or other fighting games. Usually action games consist of tests of players' dexterity, reaction time and quick-wittedness under pressure.

In shooter games, players typically aim and fire at moving objects to destroy them. This involves the development of fast hand to eye coordination and may be important in training areas associated with the police or military. In most cases the player operates virtual mechanical devices and has to accomplish some objective (e.g. drive a vehicle, fire a weapon or use a tool) [1].

Puzzle

Puzzle games primarily involve problem-solving, including words, logic and mathematics. These types of games are based on traditional puzzles. Games that involve logic, problem solving, pattern matching or all of the above fall into this game type. For example: Tetris, Bejeweled, Sudoku etc.

Strategy

Strategy games involve the player making strategic decisions within a scenario in order to meet the goal of the game, which is usually completing a level or solving a particular problem [7].

There are many good examples of this type of games, in the areas of history, economy, management, ecology, society, etc. Very popular and successful examples are: *Civilization* and *Age of Empires*.

Simulation

In simulation games, the player operates a model or simulation that behaves according to a programmed set of rules. Many simulation games focus on some elements

of realism, thus forcing players to understand and remember complex principles and relations and progress by trial-and-error [1].

These games are able to teach flying a plane up in the sky, steering a submarine deep in the ocean, etc. Good examples are *Flight Simulator*, *Train Simulator*, *SimCity*, etc.

Social simulation games are also a large component in the simulation genre, for example The Sims. Another free simulation game for Business Project Management training is INNOV8, developed by IBM a few years ago and now reaching version 2 [8].

Role-Playing

A Role-Playing Game is a game in which the participants take the roles of fictional characters. The player can perform different activities - solving quests, fighting, treasure hunting, and interacting with other characters.

In the context of learning, role-playing games are useful for providing a context for building collaborative skills, social interaction and negotiation, management of complex systems (e.g. character statistics), strategy and working through scenarios.

Sports

Sports games allow the player to simulate taking part in a sporting event or tournament. Sporting games can be used to practice the actual skills of a sport, tactics, rules and the ability to think and make decisions quickly.

Virtual Worlds

3D virtual worlds can provide opportunities for high sensory immersive experiences, with authentic contexts and activities for experiential learning, simulation and role-play, including the creation of complex environments and scenarios.

A well-known example is Second Life which enables users to interact with each other through avatars. Players (residents) can explore the world, meet other residents, socialize, participate in individual and group activities and create and trade virtual property and services with one another.

Traditional and Casual Games

Examples of such games are Chess, solitaire and card games, online 2D or 3D spaces with obstacles to overcome. Casual games are divided into many small levels that follow the same pattern. They can be played for a few minutes at a time and easily stopped and restarted.

British Education Communications and Technology Agency (BECTA) presents examples of different genres of games along with brief description (Table 1):

Table1. Examples of different genres of games along with brief description [6]

Genre	Examples	Description
Action adventure	Tomb Raider, Soul Reaver	Combines elements of combat, platform games, problem solving and exploration.
Fighting games	Tekken 3, WWF	Most popular on consoles, game play is based on two or more opponents attempting to knock the other out.
Management games	Championship Manager 2001-2002, City Trader, Zoo Tycoon	Usually based on economic management in a simulated environment. The player must raise funds to pay for maintenance, wages, research, a new striker, etc.
Platform games	Rayman, Lego Alpha Team, Abe's Odyssey	The player must complete levels by avoiding various obstacles, jumping onto platforms or using objects with special properties.
Racing games	Grand Turismo 3, Wip3out, Grand Prix 3	The realism can vary from approximate simulations of rallies using real map data, to arcade-style races, where realism is sacrificed to provide a greater sense

		of speed and present feats of driving impossible in reality.
Real time strategy	Command and Conquer, Sudden Strike, Stronghold	The player will normally command groups of units and gather resources to fund further expansion. Units move in 'real time' synchronous with the opposition's units.
Role playing games	Fallout, Baldur's Gate	The player controls a single character or group of characters. Game play is usually based around exploration and completion of quests.
Simulation games	IL2 Sturmovik, Train Simulator, Flight Unlimited	Simulation games can provide very accurate reconstructions of modern or historical vehicles.
World-building games	<i>SimCity</i> 3000, Civilisation 3, Black and White, The Sims	This category covers a wide range of game styles. Essentially, the player must manipulate either a character or an environment to encourage development and progress.

4. TYPES OF LEARNING THAT CAN BE SUPPORTED WITH COMPUTER GAMES

As already have been stated computer games offer effective pedagogical techniques that can be used in learning. Gagne describes five categories of learning with a gamut of elements that could be developed with computer games (Table 2).

Table2. Categories of Learning [3]

Category	Description
Intellectual skill	Concepts, rules and relationships and making discriminations (e.g. using algebra to solve a mathematical puzzle).
Cognitive strategy	Personal techniques for thought and action (e.g. developing a mental model of a problem).
Verbal information	Relating facts (e.g. recalling the names of the bones in the hand).
Motor skill	Actions that use the muscles (e.g. dancing).
Attitude	Beliefs and feelings (e.g. choosing to read detective fiction).

CONCLUSION

We live in a world of constantly emerging new technologies that challenge the field of education while at the same time present exciting opportunities. There is no doubt about the benefits of using computer games to support teaching and learning. This article first presented an overview of game platforms, player modes and genres (adventure, platform, puzzle, role play, shooter, sports, strategy, etc) and highlighted types of learning that can be supported with computer games.

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ОБРАЗОВАТЕЛНИ КОМПЮТЪРНИ ИГРИ ЗА РАЗЛИЧНИ ТИПОВЕ УЧЕНЕ

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Абстракт: Тази статия е свързана с изследване, проведено в сътрудничество с три висши учебни заведения – Русенски университет Ангел Кънчев, Нов Български Университет и Югозападен университет Неофит Рилски. Основната цел на проекта е изследване на иновационни методи за оценка на компетенции в среди за електронно обучение. Статията представя описание на различни типове компютърни игри и разглежда видовете учене, които могат да бъдат подпомогани от тях.

Ключови думи: Електронно обучение, компютърни игри, типове компютърни игри, преподаване, учене

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